



United States Department of the Interior

FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
WASHINGTON, D.C. 20240

ADDRESS ONLY THE DIRECTOR,
BUREAU OF SPORT FISHERIES
AND WILDLIFE

In Reply Refer To:
FSF/RF

19 July 1973

RECEIVED
AUG 20 1973

Memorandum

To: Regional Directors, Regions, 1, 2, 3, 4, 5, 6 and
Alaska Area Director

From: ^{Acting Assistant}
Director, Bureau of Sport Fisheries and Wildlife

Subject: Duck Virus Enteritis - A Contingency Plan

Enclosed is the Bureau's preventative and combative action plans for dealing with DVE.

We believe the plan is sufficiently detailed that it leaves little doubt as to who does what in the event of a DVE emergency or in preparation for such emergencies. No one has any illusions regarding costs and the extra work the planning and preparatory efforts place on budgets and key personnel, particularly refuge managers and regional office personnel responsible for developing regional contingency plans. We regret these added demands but the gravity of the situation leaves us no choice.

No doubt you already have given considerable thought to regional organization for DVE control. You are urged to proceed with dispatch to name individuals to serve in key positions, particularly as DVE Chief. These individuals, you will observe from the plan, are the principal regional figures in DVE combative programs and the sooner they are named, the better. It is suggested that at least three individuals are identified and prepared, to insure back-up personnel in case the primary incumbent is for some reason not available, or in the event of multiple simultaneous outbreaks.

Conspicuously lacking in the plan is a course of action which addresses our role in DVE outbreaks on non-Bureau lands. This omission is deliberate. We simply have not had sufficient time to explore all the possibilities, make all the contacts, and reach the agreements essential for dealing with all contingency situations. Complete and comprehensive plans will necessarily have to evolve over a period of years but we must press forward with initiatives for dealing with DVE on our lands and expand the coverage as opportunity and circumstances permit.

ST. VINCENT NATIONAL
WILDLIFE REFUGE

The starting place for expanding the coverage is, of course, the various State game and fish agencies. You are encouraged to provide the States a copy of this Bureau plan, inviting them to promulgate State plans and procedures to augment or complement our plans. You should also offer Bureau assistance to States in the event of DVE eruptions on their lands and solicit reciprocal commitments from the States to assist in our efforts to combat DVE on Federal lands. After all, no plan is better than it's weakest points and any potential DVE threat beyond the reach of effective control can cripple the best of plans. There is no stronger argument for cooperation than a mutual interest in a common cause. In this instance we all win or lose together.

Although expensive and administratively demanding, planning, staffing and preparing for combative actions are the simpler aspects of this entire matter. As you will readily agree, it is the problems inherent in preventative management that portend grave biological and political complications. This is why it is so important that you have laid the groundwork with the States in preparation for dispersal of waterfowl where it is essential. It is because of the potential adverse reactions to dispersal programs that we especially want an opportunity to review the regional contingency plans prior to any initiatives to implement them. We regret the short deadline (August 15) for submission of the plans, but the fall migration is almost upon us and considering review time even that date cuts into our prerogatives for substantive action prior to the peak of migration.

There is no need to reiterate the seriousness of this matter. It requires little imagination to contemplate the dire consequences of inaction in the face of such a deadly threat. We know you can be counted on to assign to this effort the high priority it demands. If we approach this matter in a spirit of determination and dedication, we can conquer DVE.

R. Fahl Martinson

Enclosure

DUCK VIRUS ENTERITIS
A CONTINGENCY PLAN FOR PREVENTION DETECTION AND REMEDY

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE

JULY 1973

Table of Contents

Item	Page
INTRODUCTION.	1
HISTORY-EVENTS TO DATE.	1
ACTION PLANS.	2
Preventative Management.	2
Concentration vs. dispersal	2
Surveillance.	4
Domestic Waterfowl - DVE Relationships.	5
PREPARATORY MEASURES AND CONTINGENCY PLANNING	5
Preparatory Measures	5
Supplies.	5
Disposal Facilities	6
Station Waterfowl Contingency Plans	6
Waterfowl Populations Data.	6
Dispersal of Waterfowl.	7
Concentration of Waterfowl.	8
Extermination.	8

COMBATIVE ACTIONS.	8
Attack Force - Personnel and Responsibilities	8
Attack Force Structure.	9
DVE Chief.	9
Disease Team	10
Management Team.	11
On Site Responsibilities and Procedures	12
Project Leaders.	12
Total Reporting System and Corresponding Responsibilities	15
EPILOGUE.	18

Appendix - Status Report

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE

DUCK VIRUS ENTERITIS

A CONTINGENCY PLAN FOR PREVENTION, DETECTION AND REMEDY

INTRODUCTION

Duck plague, also known as duck virus enteritis (DVE) is a highly contagious, extremely deadly epizootic virus with a potential for devastating continental waterfowl resources to mere vestiges of today's population levels. In the first known major outbreak among wild waterfowl in the United States, DVE destroyed 40 percent of a 100,000 bird flock of ducks and geese centered in and around Lake Andes National Wildlife Refuge, South Dakota, during the winter of 1972-73.

Because the Bureau of Sport Fisheries and Wildlife has the ultimate responsibility for discharging this Nation's commitments to the welfare and management of migratory wildlife resources, and especially since the first major incidence of DVE occurred on a unit of the National Wildlife Refuge System, this Bureau must take the lead in promulgating policies and plans to be supported by aggressive, positive actions for dealing with this menacing disease and its attendant problems.

The Lake Andes incident caught us unaware and ill-prepared to deal with an unprecedented situation. Scientific history will record that our Bureau acted expediently and adequately in the face of extreme adversity, especially since there was essentially no experience on which to base our actions. Now that Lake Andes is behind us--although the incident raised more questions than it provided answers--we at least have the benefit of some experience, and we do know some of the questions to be addressed. Accordingly, the scientific and social communities from this point forward will be far less amiable to any actions we undertake if they are not commensurate with the scope of the problem. It is the responsibility of each employee to shoulder his share of the Bureau's commitment to this challenging and far-reaching endeavor.

HISTORY AND EVENTS TO DATE

In order that everyone concerned is fully apprised of the situation to date, the latest status report of the Lake Andes incident is provided as an appendix to this plan.

On April 17-18 at the Patuxent Wildlife Research Center, the Bureau hosted a symposium of wildlife and disease technicians including personnel from the Bureau, the U.S. Department of Agriculture, the

Canadian Wildlife Service, and the academic community. Collectively this group represented a cross section of administrative, management, and research expertise, experienced and capable of addressing the matter of wildlife disease problems and their ramifications. The scope and depth of the DVE problem is evidenced in the following statement issued by that group:

"The duck plague outbreak at Lake Andes is a dramatic example of what may be expected to occur more frequently as the waterfowl populations are increasingly concentrated upon habitat that is progressively shrinking in size and declining in environmental quality. Increased losses from other infectious diseases can also be expected because of the same trend in the reduction of prime waterfowl habitat, and management efforts to concentrate birds on the available habitat. These disease outbreaks could result in a dramatic reduction of the continental waterfowl population, leading to possible closure of hunting seasons."

One of the most sobering--and discouraging--facts to emerge from that meeting was that much too little is known about DVE. There is substantial clinical information which deals primarily with domestic birds in controlled situations, but in the context of the immediate problem--i.e. a deadly, extremely contagious disease loose in a wild, free-flying, highly mobile continental population of migratory birds--the experts agree that we are essentially starting at base zero.

This fact immediately brings to mind the urgency of learning as much as we can, as fast as we can, about DVE and its management implications. It logically follows that a major research effort must be launched concurrently with management initiatives. Hopefully, the research effort can rapidly attain a lead margin sufficient to adequately guide management programs. Recognizing, however, that some management decisions may prove to be faulty and counter-productive, based on what is learned as the research effort progresses, the urgency of the situation demands that we do go forward with a plan of action and make adjustments as necessary.

ACTION PLANS

I. PREVENTATIVE MANAGEMENT

1. Concentration vs. dispersal

Two of the most salient DVE unknowns are (a) what triggers the shedding of the virus, and (b) how it is transmitted?

It has not been definitely established that DVE is density-dependent; some of the incidences on record occurred where there were few birds and sparse spacing. Similarly, it has not been established that stress stimulates DVE carriers to shed the virus.

Nevertheless, it is a matter of record that crowding does cause stress in some species and there are strong indications that stress may stimulate DVE carriers to release the virus, much the same way that stress associated with the female menstrual period may precipitate the shedding of the herpes virus. In any event, a contagious disease--once activated--has a rate of spread and an ultimate total impact directly proportionate to the density and numbers of the population.

There are also suggestions that weather may contribute to the shedding of the virus. It should be emphasized, however, that cold weather is not necessarily implied here. Some of the most persistent eruptions of DVE in muscovie ducks in Pennsylvania and New York have occurred regularly in May. Indications are that it is inclement extremes which are conducive to stress. Examples may be abrupt changes in temperature--hot or cold--, extended periods of rain, etc. These facts tend to discount the probability that DVE will evidence geographical propensities. We should therefore expect DVE and prepare to deal with it at any latitude, during any season, and in any climate.

Sanitation as a factor in DVE eruption is also highly suspect. Although the water quality at Lake Andes was good--based on 14 chemical analyses--(and very subjective standards)--it is a fact that filth is the most common denominator in all prior recorded incidences of DVE in the United States. Stagnation is a function of water depth and flowage, among other things, and stagnation leads to filth when animal wastes are deposited in significant quantities.

The matter of body wastes is also thought to be a key factor in the transmission of DVE, although this has not been definitely established. Since the nature of DVE involves extensive internal hemorrhaging in the intestinal tract, there is usually a discharge of body fluids, including blood, incorporated with the fecal matter of infected birds. If the virus is, in fact, transmitted through feces, this then lends another dimension to crowding as a factor in the occurrence of DVE.

For all the foregoing reasons there is ample justification, generically speaking, to discourage large concentrations of waterfowl.

Bear in mind we are speaking at this point of preventative measures... what we can do before the fact to reduce the probability of DVE occurring. What to do after the fact will be discussed in a later section of this plan.

Our memorandum of March 5 (Memorandum Alert--Duck Virus Enteritis) instructed you to identify potential trouble spots and to begin preparation of contingency plans for preventing large waterfowl concentrations as well as measures for dispersing undesirable concentrations which are currently existent. We followed up on April 2, announcing the DVE workshop, postponing the requirement for those contingency plans until after the Patuxent meeting. We trust you have continued to work on the plans; this document reinstates the requirement for the completion of the contingency plans.

Plans should deal primarily with Bureau controlled lands with management prescriptions and recommendations--including alternatives--for each potential trouble spot in each region. Recognizing, however, that many potential problem areas are on State and private lands, and further, that non-Bureau lands and their owners will necessarily be involved in dispersal operations, no regional plan will be complete that does not address all the potential problem areas regardless of who owns or controls it. Nevertheless, with regard to non-Bureau areas, at this time you are requested only to identify the potential problem areas, providing your recommendations as to what should be accomplished and how, as well as your assessment of the political climate in each case. Any substantive initiatives in this instance should only be taken after this office has had an opportunity to review and approve your recommendations.

We are fully aware that in some situations breaking up and/or dispersing waterfowl concentrations is inadvisable, for a number of reasons. In some instances the consequences of dispersal may have an even greater detrimental impact than the DVE potential. Nevertheless we want you to look at each concentration area and evaluate it on the basis of its merits: (1) as an entity and (2) as a part of or in relation to the flyway(s). These plans should be submitted as soon as possible but in any case no later than August 15.

After this office has had an opportunity to review and approve the plans, they will be returned with appropriate comments, recommendations, etc. It will then be the responsibility of the regional directors to inform the States of our plans and intent, inviting them to participate in State-wide efforts to implement the plans. The Assistant Director for Operations will have the responsibility for coordinating the plans with the Flyway Councils.

2. Surveillance

Managers are encouraged to make frequent checks of waterfowl that are concentrated, especially in limited water areas. Because mortality is a natural component of population dynamics, the evaluation of potential disease outbreaks necessitates a judgment of whether the level of mortality is abnormally high. This judgment should consider

the degree of seasonal mortality that is "normal" for that particular area. A dozen dead birds from a wintering concentration following the hunting season might not be significant, but a dozen deaths on the summer range could signal the onset of an outbreak. Because scavengers are quite efficient in eliminating carcasses, any mortality should be investigated as if disease were involved, even if only a few specimens are found. A single case of virulent, highly contagious disease is significant and warrants immediate response.

You are cautioned to exercise discretion and judgment in evaluating and reporting alleged disease eruptions. With the extremely limited facilities and personnel available for diagnosis purposes, we could easily become overwhelmed by false-alarms and inconsequential matters, even to the extent that a real threat may get out of hand before we could muster our forces to fight it.

3. Domestic Waterfowl--DVE Relationships

While the exact source of DVE at Lake Andes is conjectural, it is logical to conclude that since there are few records of DVE in wild waterfowl on the North American continent, there is obviously some association--however remote--with aviculturists flocks.

Therefore, effective immediately, no waterfowl from any source--private aviculturists, game farm breeders, and foreign countries included--may be introduced on any refuge, hatchery or research facility without first having been inspected and certified free of DVE, or in the absence of such certification, specific authorization by the Bureau Director.

Moreover, Bureau employees who frequent Bureau facilities which waterfowl also use are discouraged from maintaining aviaries or domestic waterfowl. Refuge employees who do maintain domestic waterfowl are hereby required to also maintain current negative DVE certification from a qualified individual or laboratory.

II. PREPARATORY MEASURES AND CONTINGENCY PLANNING

1. Preparatory Measures

There are certain basic apparatus and materiel, information and plans that each project leader must immediately develop or procure and maintain current. In the event that DVE does erupt on the refuge, the following materials and/or arrangements are essential to the efficient handling of the outbreak:

A. Supplies (To be on hand or immediately available)

- (1) Plastic bags (various sizes) for carcass storage and transport.
- (2) Rubber or disposable gloves, rubber boots, coveralls, and head covering.
- (3) A disinfectant: household bleach, Lysol, Envivon (Preferably - Vestal Laboratories, 4963 Manchester Ave., St. Louis, Missouri 63110), sodium hypochlorite, sodium carbonate.
- (4) Buckets and brushes for cleaning boots and other contaminated surfaces such as boats, etc.
- (5) Materials for restraint and holding facilities should be available.

B. Disposal Facilities--Burning

Burning of infected carcasses and paraphernalia is preferred over burying. Refuge managers shall have identified and made arrangements for the use of incinerators in the area. In the absence of burning facilities, land fills will be utilized. Extreme caution will be exercised in the selection of land-fill sites; aspect, drainage, and proximity factors will be considered to insure maximum safety with regard to further environmental contamination.

In either case, burning or burying disposal should take place on-site if it logically can be accommodated.

C. Station Waterfowl Contingency Plans--Refuge Managers

Refuge managers should immediately prepare a refuge plan (to remain at the field station) to be used primarily by the Attack Force as a guide or aid in decision-making relative to DVE combative strategy. (Station contingency plans need not be fancy or elaborate. All of the essential data need not be physically located in the plan itself, but must be immediately available in the station files with the exact source and location documented in the station plan.) In the process of refuge inspections supervisory personnel should review station plans for adequacy. The plan shall include:

(1) Waterfowl Populations Data

- (a) Species and numbers - Graphic depiction of past 10-year waterfowl history by major species and populations.

(b) Migration Chronology - Dates or periods of arrivals, peaks, and departures.

(c) Migration Routes and Distribution Records - From band returns and other sources, plot major areas the refuge flocks frequent during migration to and from the refuge. Also plot daily and seasonal activities and distribution patterns for period that birds are present on the refuge and the general area.

(2) Dispersal of Waterfowl

Not to be confused with "preventative" break-up of concentrations. This aspect of the plan deals with emergency, combative measures which come into play after DVE erupts. Decisions regarding dispersal of birds can be properly made, only if all the pertinent facts are at hand.

(a) Consequences of Dispersal - Managers should know the most probable immediate and eventual movements of dispersed birds. Anticipated results and consequences of each alternative should be explored.

(b) Mechanics of Dispersal - The "how" of dispersal is also extremely important. In view of past experiences we know that moving large numbers of waterfowl is difficult at best, impossible in some cases. Some of the dispersal proposals will be unproven and without precedent, therefore conjectural. For this reason, exhaustive consideration of all possibilities should be documented.

(c) Materiel (Hazing devices, equipment, etc.) - Sufficient quantities of pyrotechnic paraphernalia including such items as fireworks, automatic exploders, etc., should either be on hand or immediately accessible. Arrangements should also be made for Bureau approved rental or contract watercraft, aircraft, etc., as may be required. Locations and capacities of local airports and air strips should be identified to accommodate Bureau or contract aircraft which may be pressed into action. Managers are urged to obtain the assistance of Wildlife Services and Wildlife Research personnel in securing and employing hazing devices and procedures.

(d) Water Manipulation - Since water is a major factor in influencing waterfowl movements, the refuge water system is an important adjunct to dispersal (or concentration) of birds. Managers should document complete details of the refuge water system, including: source(s), pumping and transmission systems, and discharge capabilities. The ramifications of discharging infected water are extremely important. This matter should be explored in great depth - particularly the legal ramifications. This aspect of the plans should more appropriately be explored by regional solicitors.

(3) Concentration of Waterfowl

It may be advisable to concentrate and hold a flock on the refuge. The plan should address this aspect of the operation, laying out in detail how it could be accomplished. Sources of adequate feed grains should be identified and understandings with owners or managers of areas frequented by the flocks off the refuge should have been prearranged in the event it becomes necessary to discourage waterfowl from leaving the refuge.

(4) Extermination

There may be situations sufficiently severe to warrant the sacrifice of entire waterfowl flocks. Decisions of such major magnitude will be reserved for the Bureau Director or his delegate (DVE Chief). Once the decision is made, the most expedient method(s) will be employed. Extermination actions are to be closely coordinated by the DVE Chief with the Assistant Director for Operations and the Regional Director.

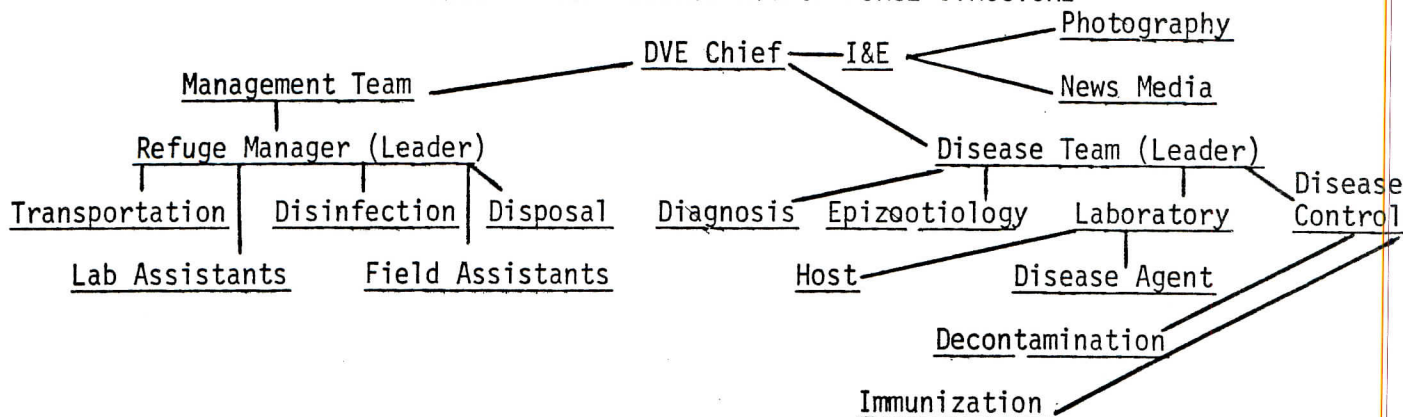
III. COMBATIVE ACTIONS

In order to develop and implement the most efficient and effective contingency plans for dealing with DVE outbreaks it is imperative that distinct lines of responsibilities and communications be established.

1. Attack Force - Personnel and Responsibilities

The primary thrust of the DVE control program will be an aggressive offense, based on the attack force concept. A Bureau Disease Attack Force is hereby created and shall be structured according to the following nomenclature:

RECOMMENDED DISEASE ATTACK FORCE STRUCTURE

A. DVE Chief

The Chief of the Attack Force is the key individual in DVE combative programs. He is a regularly employed member of the regional office staff; DVE responsibilities are additional to regular duties. The incumbent may be anyone of the regional director's choosing, may be attached to any division or office. In any event, however, due to the importance and scope of the assignment, the incumbent should be at least the equivalent of an assistant division supervisor. The duty may be shifted or transferred, depending on the situation, but continued involvement by one individual will surely result in improved competence.

The DVE Chief is authorized to act with full authority and responsibility of the regional director, including temporary assignment of personnel and expenditure of funds.

(1) Preparatory Actions

Once the regional director orders the Attack Force into action, the DVE Chief assumes immediate responsibility for logistical procedures, including:

(a) Notification of Attack Force personnel (other than the primary Disease Team which shall be directed to the site by the Assistant Director for Research.) It is presumed that liaison between the DVE Chief and the central office is maintained current. If additional personnel are needed to support the primary Disease Team, the DVE Chief is responsible for appointments of and arrangements for same.

(b) Arranges travel authorizations.

(c) Establishes contact with the central office (AO) and the involved project leader; provides interim

instructions for refuge managers, to prevail until he (DVE Chief) is on-site.

(2) On-Site Actions

When the regional director orders the Attack Force into action, the DVE Chief puts aside all other duties, makes all essential preparatory arrangements, and proceeds with dispatch to the affected area. Once on the scene, he assumes full responsibility for the Bureau's on-site operations:

(a) Provides overall direction of the Management Team operations (supervised by the refuge manager) and the Disease Team activities (supervised by the Disease Team Leader); all major matters of policy or procedure are reserved for and resolved by the DVE Chief.

(b) Handles all field or regional contacts with the news media, both written and verbal. All field or regional news releases should be cleared through the DVE Chief. All field employees must refer media contacts to the DVE Chief.

(c) Maintains liaison with the regional director, the central office, and the involved States.

B. Disease Team

The Assistant Director for Research has the responsibility--whether by recruitment or reassignment--for staffing and specifically identifying the primary members of the Disease Teams. Disease Teams will be peculiar to their respective geographical area - east or west - and will function irrespective of regional boundaries. Disease Team leaders may request additional support personnel who are subsequently designated by the DVE Chief. (Not to be overlooked as candidates for Disease Team details are the Division of Fish Hatchery personnel who have participated in training at the Eastern Fish Disease Laboratory, Leetown, West Virginia.)

(1) Disease Team Leader

The Disease Team Leader advises the DVE Chief in all technical matters relating to disease and its ramifications. Although designated by the Assistant Director for Research, while at the disease-site the Disease Team Leader is under the general supervision of the DVE Chief and subject to his decisions. The Disease Team Leader coordinates closely with the Management Team Leader to insure the most

efficient and effective control program possible. Disease Team Leaders may change from case to case but insofar as is practicable should serve over extended periods in order to gain proficiency through experience.

(2) Diagnostician - Attack Force Advance Man

The diagnostician is a vital element of the Attack Force. He is designated by the Assistant Director for Research--in advance--and would logically double as the Disease Team Leader. A total of four (4) diagnosticians-- 2 in the east, 2 in the west--one primary and one alternate will be named. One of these - east and west - will be available at all times. This assignment will be in addition to regularly assigned duties but will take priority over all other responsibilities. The advance man must be qualified and competent to recognize DVE, evaluate and assess the situation comprehensively and make appropriate recommendations to the AR. Notified by the AR of a potential DVE threat, the advance man will immediately make telephone contact with the involved refuge manager and ascertain sufficient details to either;

(a) Set up a DVE alert while further information is gathered, or,

(b) If warranted, proceed directly to the alleged DVE site.

C. Management Team

The refuge manager (project leader) serves as the Management Team Leader. He acts in consonance with the Disease Team Leader and has responsibility for all operations, equipment, and logistics which augment, support, and complement the technical disease control efforts. The refuge manager supervises all personnel (permanent, temporary, or detailed) assigned to the Management Team but in all DVE related matters is subject to the general supervision of the DVE Chief and yields to his decisions. (Normal, routine refuge administration, independent of DVE operations, is not relinquished by the project leader). In short, once technical disease control objectives or direction are identified or specified by the Disease Team and the DVE Chief, it becomes the responsibility of the refuge manager to see that the work is accomplished.

2. On-Site Responsibilities and Procedures

A. Project Leaders

The refuge manager is a major figure in DVE control programs.

(1) Detection

In the near future it is anticipated that visual aids and various informational matter will be disseminated to all Bureau field personnel who would logically come in contact with DVE. The materials will be sufficiently comprehensive to enable managers and biologists, to recognize DVE by gross lesions, waterfowl actions, and other signs. If after thorough consideration of all available information and evidence, the refuge manager believes DVE to be present, he should immediately make the appropriate report.

(2) Reporting

The project leader is the initial link in a total reporting system. (To be specified in a latter section). Refuge managers should be prepared to provide the following information when making initial reports to his regional refuge or land management supervisor, and recount it later (with updated data) when he is contacted by the Attack Force Diagnostician:

- (a) An estimate of the magnitude of the outbreak (area and numbers).
- (b) A tally of the numbers and conditions of affected birds.
- (c) The species involved.
- (d) The species in area but not affected.
- (e) The chronology of the outbreak including the onset and trend of mortality or morbidity.
- (f) Major population movements (dispersing, building up, static).
- (g) Signs exhibited by affected animals.
- (h) Unusual and current environmental conditions, including weather, food supply, possible exposure to toxic chemicals.

(i) History of disease on the area.

(j) Location of area aviculturists flocks.

(3) Collecting and Preserving Specimens

Presumably, the reporting system, within a matter of hours will have resulted in telephone contact between refuge manager and disease diagnostician. In anticipation that specimens will be required, the following procedures shall be followed:

The chapters on "Post-mortem Examinations" and "Collection and Field Preservation of Biological Materials" in Wildlife Management Techniques, 3rd Ed: Revised (Robert H. Giles, 1969, The Wildlife Society, Wash. DC) provides a useful review in preparing for specific aspects of preliminary disease investigations.

To accurately diagnose disease, the causative agents usually need to be identified. This is best accomplished by laboratory examination of fresh specimens collected and properly preserved at the time of the outbreak.

Specimens should be placed in individual plastic bags and then each placed in a second bag, taking care not to contaminate the outside of the second bag. The first bag may be used as a "glove" by grasping the bottom with one hand and pulling it up and over the arm with the other hand. The specimen is then picked up with the "gloved" hand and the bag is pulled off the arm and over the specimen and then tied.

Some specimens (at least 3) should be frozen and others only refrigerated pending additional instructions from the diagnostician or disease specialists at the laboratory. The laboratory will provide instructions for handling large quantities of specimens. The diagnostician will provide exact instructions as to where and how specimens are to be shipped.

(4) Refuge Closure

If, after initial contacts with the Disease Diagnostician, the facts tend to indicate that DVE is present, the refuge manager will effect an immediate closure of any vital portion, or all of the refuge. Refuge closure is authorized in 50 CFR,

Section 25.5, 26.3, 28.25, and 28.27. Managers should implement a rigid closure but should maintain a reserved profile with regard to publicity until such time as the DVE Chief is available to handle news releases.

(5) Refuge Quarantine

The refuge closure will remain in effect until such time as laboratory diagnosis confirms the presence of DVE. Once an official diagnosis is announced, the refuge manager will implement a quarantine. Prior arrangements shall have been made with the appropriate health officials for cooperation and assistance in establishing and enforcing the quarantine. Publicity regarding the quarantine will be handled by the regional DVE Chief.

(6) Preparations for Accommodations of Attack Force

The refuge manager will make initial arrangements for transportation, housing accommodations, and other requirements of Attack Force personnel detailed to the project.

(7) Management Operations and Logistical Support

The refuge manager is responsible for arrangements, procurement or contractual services for all equipment, vehicles, fuel, tools, and supplies required for the management portion of the operation (the Disease Team will provide disease related material).

(8) Decontamination and Sanitation

Although disinfection of apparel during the investigation is needed to limit the spread of the pathogen, a thorough decontamination of all contaminated surfaces and equipment is necessary after the outbreak has subsided.

Clothing, surfaces and equipment may be decontaminated by washing and liberal application of a household bleach or by burning. Thorough cleaning by removal of feces, blood and other body fluids is essential for disinfection. All infected material should be gathered and either disinfected or disposed of by the methods as outlined (see other section). Chlorination of water areas, if necessary, should be under the direction of the Disease Team, but responsibility for logistical support rests with the refuge manager.

As an adjunct to the quarantine, it is imperative that all personnel physically involved adhere strictly to de-contamination and sanitation constraints of the quarantine.

3. Total Reporting System and Corresponding Responsibilities

An efficient and effective disease control program cannot function adequately without thorough and immediate dissemination of factual and current information to all involved in and concerned with control operations. Accordingly, the following reporting system, procedures and responsibilities are hereby established. (All initial reporting at each personnel level and subsequent reports of substantive content should be made by the most rapid means--telephone, telegraph, etc., and if made verbally, followed by written confirmation.)

A. Project Leaders

The refuge manager's first contact shall be the regional refuge or land management supervisor. This puts the regional office on alert and sets in motion the informational and combative action plans. After initial contact with the regional office, the refuge manager will remain available for telephone contact from the Attack Force Diagnostician.

B. Regional Refuge Supervisor

Upon receipt of a DVE report from the field, the regional refuge - land management supervisor immediately informs the regional director, apprising him of all pertinent details. He should also alert other division personnel who have been designated as primary candidates for details to DVE operations.

C. Regional Director

The Regional Director has responsibility for two concurrent actions:

- (1) Informs his designated DVE Chief of the DVE alert.
- (2) Informs the central office of the DVE potential. The Assistant Director for Operations is the initial CO contact. Notified by the AO of an actual DVE emergency, the RD immediately informs the regional DVE Chief that the DVE alert has become a DVE emergency and assigns top regional priority to the control effort.

D. Assistant Director for Operations

The AO has overall responsibilities for Bureau DVE control efforts including personnel actions (other than Disease Team) funding, and coordination. He maintains liaison with the DVE Chief, advises him in matters of policy and major decisions (after consultation with the Bureau Directorate). A major decision for example, would be whether to exterminate an entire flock of waterfowl. He coordinates the DVE activities of other involved divisions and the directorate staff. He is responsible for all central office contact with the news media, the Flyway Councils, the State Game and Fish agencies, conservation organizations and other Federal agencies, and the Governments of Canada and Mexico. The AO will cooperate and coordinate with the Assistant Director for Research to insure that DVE management programs and research efforts are compatible and complementary.

Upon receipt of DVE information from a regional director, the AO immediately relays to the Assistant Director for Research essential data for initiating an investigation. Advised by the AR that the DVE threat is significant to warrant the action, the AO declares a DVE emergency and directs the RD to order a DVE attack.

E. Assistant Director for Research

In addition to responsibilities for staffing and funding the Disease Team, the AR also has overall responsibilities for guidance and funding of DVE-associated research and diagnostic laboratory facilities. In actual DVE emergencies the AR advises the Director on matters of significance (whether and how to exterminate waterfowl flocks, for example).

Notified by the AO that a DVE threat exists, the AR immediately informs his designated (in advance) stand-by Diagnostician (Attack Force Advance Man) instructing him to initiate preliminary investigations. The AR should then remain available to the Diagnostician for further consultation. Upon receipt of a convincing report from the diagnostician, the AR immediately informs the AO who officially declares a DVE emergency.

Concurrently, the AR shall authorize all essential travel and expenditures of the Disease Team and will order all primary members of the team into action.

F. Disease Team Advance Man - Diagnostician

Upon notice from the Assistant Director for Research, the diagnostician immediately initiates contact with the refuge manager. The advance man has the sole responsibility for recommendations to the AR and for this reason should not hesitate to proceed directly to the scene for on-site inspection. DVE alerts shall take priority over any other assigned duties of the diagnostician.

G. Regional DVE Chief

The duties and responsibilities of the DVE Chief are detailed under the Attack Force section of this plan. Reporting is an integral part of the DVE Chief functions. Ordered into action by the regional director, the DVE Chief assumes responsibility for the combative action; he establishes liaison with the central office (AO) and the refuge manager, makes preparatory arrangements then proceeds immediately to the site.

The Regional Director (through his DVE Chief) will be responsible for informing the State of the DVE emergency. Circumstances will dictate whether the initial contact is made immediately from the RO in conjunction with other liaison arrangements, or after the DVE Chief is on the scene, but in any event the contact will be made as early as it feasibly can, will be as concise but complete as possible, and will include an official invitation to the State to participate in the DVE operation.

EPILOGUE

During the latter half of August, (dates to be announced) a DVE symposium will be conducted at the Eastern Fish Disease Laboratory, Leetown, West Virginia. Each region will send three participants (one only from Alaska). It is recommended that each region's first choice for DVE Chief should participate along with two key field people who have demonstrated ability to react well in stress situations. A project leader from a major refuge where DVE may logically erupt would be a logical candidate and it may be well to involve one individual from a division other than refuges. Game management agents, wildlife services biologists, or fish hatchery personnel who have had disease training are all prospective candidates.

We realize that 20 trainees is a modest beginning, but it will represent a reservoir of informed personnel who can function effectively until more and more can be trained.

When we have had sufficient time to review your regional DVE contingency plans, you will be advised of the central offices' reactions. Meanwhile you are urged to press forward with regional organization to provide adequate compliance with the spirit and the specific intent of this action plan. This is a matter of extreme importance.

July 19, 1973

APPENDIX

The Duck Virus Enteritis Outbreak
at the
Lake Andes National Wildlife Refuge
Charles Mix County, South Dakota
January - March 1973

HISTORY

Traditionally, ducks have always wintered on the Missouri River in South Dakota. With the development of artesian wells on Lake Andes proper, the first one in the 1890's, ducks began exchanging between the river and the lake in the early 1900's. Lake Andes National Wildlife Refuge was established in 1936 to provide sanctuary for migrating waterfowl.

In 1953, Fort Randall Dam was completed on the Missouri River approximately 7 air miles from Lake Andes. At that time, the 6½ miles of river between the dam and the Nebraska state line, as well as the reservoir itself, were designated a waterfowl refuge by South Dakota state law and closed to all waterfowl hunting. Since the Corps of Engineers continually discharges water (averaging 20,000 cfs, but varying from nearly zero to 35,000 cfs) from the dam during the winter months, from 1 to 5 miles of river below the dam remain open. This open water area, being a refuge, attracts large numbers of waterfowl.

By 1954 all artesian wells on Lake Andes Refuge had become non-functional, so in 1957 a 940 foot deep, 12 inch artesian well was drilled along the north side of the Owens Bay unit of the Refuge. Ducks continued to exchange between the river and the refuge during the winter, but at times of cold temperatures most of the ducks in the area stayed on the refuge since the artesian well water was quite warm (65°F).

PRESENT REFUGE MANAGEMENT

The 350 acres of cropland under cultivation at the refuge are planted to corn and milo. The crops are left standing in the fields to provide a deterrent to waterfowl depredations on neighboring farmlands, as well as winter food for waterfowl, deer and upland game. These crops are then mechanically knocked down in the spring so the fields can be cleaned up by migrating waterfowl. Waterfowl have been fed artificially on the refuge (except for banding operations) only once, during the severe winter of 1968-69 when starvation was imminent.

The artesian well is an integral component of the habitat management program on the refuge. The well facilitates water level management of Owens Bay and other water areas on the refuge, and has been allowed to flow throughout the winter months to provide open water for wintering waterfowl. In recent years wintering duck populations have fluctuated between 40,000 and 150,000 birds, approximately 99% of which are mallards. About 10,000 Canada geese have also wintered in the area.

CHRONOLOGY OF EVENTS

On January 13, refuge personnel noticed an abnormally high rate of mortality among the estimated 100,000 mallards and 9,000 Canada geese utilizing the artesian well area in Owens Bay. The mortality persisted and on January 19, the Northern Prairie Wildlife Research Center, Jamestown, North Dakota, was notified and specimens were referred to the Animal Disease Research and Diagnostic Laboratory, South Dakota State University, Brookings, South Dakota.

A tentative diagnosis of Duck Virus Enteritis (DVE) was made on January 23, and Bureau of Sport Fisheries and Wildlife (BSFW) and U. S. Department of Agriculture (USDA) officials were notified. The diagnosis was substantiated by further examination of specimens at the refuge by Northern Prairie and South

Dakota State University veterinarians on January 25. On January 26, ducks dying of DVE were also found on the Missouri River below Fort Randall Dam. Since DVE was classified as an exotic disease in the U. S., quarantine measures were immediately instituted on the refuge to prevent spread by vehicles or personnel. Feed was provided to reduce the movement of waterfowl from the refuge until control measures could be initiated.

South Dakota Department of Game, Fish and Parks (SDGFP) officials were notified by the area conservation officer who remained on the scene and made invaluable contributions to the effort. At the same time, BSWF officials notified the Canadian Wildlife Service, chairmen of the Central and Mississippi Flyway Councils, and the states of Nebraska and North Dakota as to the status of the outbreak.

On January 27, tissues from affected waterfowl were submitted to the Veterinary Services Diagnostic Laboratory, USDA, Ames, Iowa, and a histopathologic diagnosis of DVE was made on January 29. By February 2, virologists at that laboratory had demonstrated typical Herpes virus particles in liver material from Lake Andes mallards and also found liver suspensions from these birds to be lethal for duck embryos but not chicken embryos.

The first evidence of migration into the area was the appearance of approximately 5,000 additional small Canada geese on February 3.

In a February 5 Washington meeting, USDA, which has jurisdiction over exotic diseases, relinquished its authority to the BSWF since wild migratory waterfowl were involved.

On February 7, Bureau Director Smith and Assistant Directors Martinson and Loveless met at Lake Andes with Director Hodgins, Area Supervisor Brunken

and Conservation Officer Nelsen of the SDGFP, Bureau officials from the Denver office, and Bureau refuge and disease staff personnel to inspect the outbreak and develop a course of action for its control. The plan which was developed included:

1. Maintaining strict quarantine of the refuge to prevent spread of the disease through human activities.
2. Chlorinating the open water of Owens Bay, attempting to achieve a residual chlorine level of 5 ppm.
3. Applying sodium carbonate over the ice on Owens Bay to increase the pH as the surface melted, thereby inactivating virus in feces on the ice.
4. Picking up dead and dying waterfowl on the refuge and river, and disposing of carcasses by incineration and burial.
5. Sampling the free-flying population to determine the percent of exposure and of virus shedders, and banding and colormarking to permit monitoring of movements.
6. Placing additional wing-clipped, susceptible mallards on Owens Bay and the Missouri River to monitor transmission.
7. After sampling of the flock and instituting disinfection measures, but before the arrival of migrants, dispersing all waterfowl from Owens Bay to the Missouri River where flushing, dilution and the larger available open water area would reduce the rate of transmission.
8. Shutting off the artesian well, draining Owens Bay, and chlorinating the discharge water. Draining the bay would prevent use of this most heavily contaminated area of the refuge by migrating waterfowl.
9. Initiating a surveillance program to monitor the movement of ducks from Lake Andes and detect other possible outbreaks during the spring migration.

On February 8, an extensive manpower effort involving both BSWF and SDGFP

personnel was launched to chlorinate the water, treat the ice with sodium carbonate, and pick up and dispose of dead and sick birds. Due to the disturbance created by these activities, many of the ducks and geese on Owens Bay began moving to the Missouri River during daylight hours. When carcass pickups were conducted on the river, the birds relocated on the 6 mile stretch of river they were using.

The USDA Veterinary Services Diagnostic Laboratory, Ames, Iowa, reported on February 12 that the virus had been isolated and serologically identified as that of Duck Virus Enteritis, thus confirming the diagnosis.

On February 13, 14 and 15, a total of 413 mallards from the Lake Andes flock was banded and color-marked for visual observation. The ducks were marked on the wings, back and tail with yellow (91) and red (322) paint to assist in monitoring movements of the flock as it dispersed from the refuge. An alert was issued to wildlife agencies, organizations and the public to report any sightings of these birds. Blood samples and cloacal swabs were also collected from these ducks to determine the percent of exposure and of virus shedders in the flock prior to dispersal. Final results of these studies are not yet available.

With quarantine, chlorination, sodium carbonate treatment, carcass pickup and disposal, and planned research activities completed or well under way, on February 17 active dispersal of the birds from Lake Andes was initiated. The artesian well was shut off and drainage of Owens Bay and chlorination of the discharge water was begun. Devices such as propane exploders, shell-crackers and plastic flags were used to keep all waterfowl off Owens Bay both day and night.

By February 23, warm weather had created abundant sheet water in the fields and the Lake Andes birds became widely dispersed throughout the area. The first pintails in the area were also seen on February 23, and by March 4

migration was well under way with most common diver species appearing on open water areas in the middle unit of Lake Andes. By March 12, all units of Lake Andes were completely free of ice.

As water levels in Owens Bay dropped, the efficacy of the chlorination of the discharge water decreased. Therefore, on March 13, an aerial application of 2,000 pounds of sodium hypochlorite was made to the remaining 100 acre feet of water in Owens Bay. Drainage of the bay is continuing, and the artesian well flow has been diverted directly into the south unit of Lake Andes. On April 6, burning of dense vegetation around Owens Bay was begun as a further disinfection measure.

THE DISEASE

Duck Virus Enteritis, also known as Dutch Duck Plague or Duck Plague, has occurred as a disease of domestic waterfowl since at least 1923 in the Netherlands, but was not described as a distinct disease until 1942. The virus was isolated and differentiated from other known viruses in 1949. DVE has also been confirmed in domestic waterfowl in Belgium, England and the United States, and has been suspected in domestic waterfowl in France and China.

DVE is an acute, usually highly contagious herpesvirus infection of ducks, geese and swans and is characterized by hemorrhages, degeneration and necrosis of liver and lymphoid tissue, and severe diarrhea. Most species of wild and domestic waterfowl are known to be susceptible. Other domestic and wild animals are not known to be affected. DVE does not affect humans.

The incubation period in domestic waterfowl is reported to range from 3 to 7 days, followed by 1 to 5 days of clinical illness. However, some waterfowl may be found dead without signs of DVE having been observed. The death rate usually is quite high in susceptible flocks and has been reported to range from

5 to 100% in domestic waterfowl. Survivors are said to be immune. Asymptomatic carriers of the virus may occur among survivors and maintain the infection between outbreaks. DVE may occur at any season, but most U. S. outbreaks among domestic and captive waterfowl have occurred in the spring.

The virus is reported to be instantly inactivated at pH 3 or below and at pH 11 or above. Most common viricidal agents are probably effective disinfectants, although definite information is lacking. Sunlight and desiccation will, in time, also inactivate the virus. At room temperatures, infectivity is reported to be lost in 30 days.

DVE is thought to be spread by infected waterfowl that shed the virus in feces or other body discharges. Susceptible waterfowl may become exposed either directly through contact with infected waterfowl or indirectly through contact with a DVE virus contaminated environment. Virus contaminated shallow pools and stagnant or slow moving bodies of water have been thought to be important sources of infection in many domestic duck outbreaks. Ingestion is probably the most common route of virus exposure.

DVE was unknown in the United States before 1967. That year it appeared in the heart of the commercial duck industry on Long Island, New York, and killed a small number of free-flying and captive waterfowl on Long Island and in upstate New York. In addition to periodic outbreaks in these areas subsequent outbreaks have occurred in small numbers of free-flying waterfowl in Maryland and in captive waterfowl in Pennsylvania. The first outbreak of DVE in the western part of the country occurred in the spring of 1972 at a park in San Francisco. Small numbers of domestic and captive waterfowl died during this outbreak.

The source of the original United States outbreak has not been determined and much remains to be learned about the natural history of this disease. Control of DVE within the Long Island commercial duck industry is dependent

upon improved management and the routine use of a modified live virus vaccine.

THE LAKE ANDES OUTBREAK

The outbreak at Lake Andes is the first known occurrence of DVE in epizootic proportions among free-flying waterfowl. The outbreak spanned a period of approximately two months and killed an estimated 40% of the 100,000 mallards in the area.

Diagnostic and research activities associated with the outbreak involved professional disease investigators from three BSW Wildlife Research Centers, South Dakota State University, and the USDA Veterinary Services Diagnostic Laboratory.

Clinical Signs

Observations at Lake Andes indicate that mallards may die within 6 days after exposure to the virus. Clinical illness in the acute phase of the outbreak is of short duration and most ducks probably die within 24 hours after signs of disease become evident. The first noticeable signs of disease are a droopy appearance, increased thirst, slower than normal movements, reduced wariness, and a reluctance to fly. As the disease progresses, the birds lose their ability to stand and to fly and may propel themselves along the ground with their wings. Death on water may be preceded by a series of convulsions in which the head is extended over the back and pointed towards the tail, which is elevated and fanned, as the bird swims in a circle; during this time rapid wing flapping often occurs and the bird may have difficulty holding its head out of the water. Affected birds may seek dense vegetation, perhaps due to a sensitivity to light. On land careful examination of the bird's terminal position and its surroundings will often disclose that convulsions occurred just prior to death. In addition, the severe enteritis produced by this disease results in bloody feces. Congregating areas for large numbers of waterfowl may

show the presence of bloody feces and droplets of free blood. It is not unusual to find areas of blood several inches in diameter where infected birds have been sitting.

Canada geese and ducks may die in a rather characteristic position with the neck arched, the bill perpendicular to the supporting surface, wings slightly drooped and legs extended to the rear with the bottom surfaces of the webs up. Other ducks, and occasionally geese, may be found dead with the head over the back, the tail fanned and the wings partially extended.

External Lesions

Examination of dead ducks often discloses a bloody discharge from the nares and bill, (especially if the bird is suspended by the feet), a blood stained vent and, in the case of male mallards, a prolapsed penis. None, all, or any combination of these lesions may be present in a particular bird. Blood stained vents occur in most Canada geese that die from DVE, but bloody discharges from the bill usually are absent.

Internal Lesions

Upon necropsy, gross examination of the viscera often discloses multiple areas of focal necrosis (pinhead size or larger yellow or whitish spots) on the liver, or a discolored liver (copper rather than mahogany color) with patches of hemorrhage (red blotches). The surface of the heart may also show areas of hemorrhage; these vary from pinpoint size on the fatty areas to large blotches on the heart muscle. Edema (clear to cloudy yellow fluid) may be present around the syrinx, and the surface of the syrinx may contain numerous pinhead size or larger hemorrhages. The spleen is dark in color and often reduced in size. The general appearance of the intestines is often hemorrhagic, or distended and dark blue to purple in color due to the presence of free blood

within the lumen. The four lymphoid rings of the intestines of mallards are often very prominent and may appear as hemorrhagic bands that circumscribe the intestine. As the outbreak progressed, the mallards tended to show less severe intestinal hemorrhage and more pronounced ulceration and necrosis of the intestinal lining. The lymphoid tissue in the intestines of Canada geese is in the form of discs instead of rings and these may be quite prominent, but usually less hemorrhagic.

It should be noted that these observations pertain principally to mallards and Canada geese since other species at Lake Andes were limited to a few specimens. However, there were some indications that in species such as golden-eyes and common mergansers, generalized hemorrhages may be less extensive than in mallards, and ulceration and necrosis of the intestine more common.

Water Quality

Water quality studies conducted on Owens Bay during the outbreak by the USDA Veterinary Services Diagnostic Laboratory showed the water to be "of suitable quality for habitation by waterfowl."

Weather

In early January, prior to the outbreak, temperatures at Lake Andes ranged from lows of -15°F on January 8 and 9 to a high of 40°F on January 12. On January 8, 1.1 inches of snow was recorded in the area. Between January 13 and February 5, low temperatures ranged from 7 to 35°F while highs varied from 25 to 55°F; 6.1 inches of snow was recorded during this period. Colder weather characterized the period from February 6 to 18, with a low of -16°F on February 16 and highs of 46°F on February 11 and 18. On February 13, 3.7 inches of snow fell and the total snowfall for the period was 6.1 inches. Temperatures then rapidly moderated to a high of 62°F on February 23 and have generally remained

above freezing since.

Mortality

Mortality peaked in late January at about 1,000 birds per day and declined sharply after the birds dispersed to the fields in late February. Losses on the refuge dropped to virtually zero following active dispersal on February 17, but increased on the river as the flock shifted to that area. Mortality on the river continued until February 23 when it dropped as the birds dispersed to the fields.

In addition to the mallard losses, approximately 3% of the Canada geese on the refuge at the time of the outbreak may have died. Small numbers of other species of ducks were also present and all suffered losses. These included black ducks, pintail-mallard hybrids, American widgeon, wood ducks, American goldeneyes, redheads and common mergansers. No differential mortality between sexes was noted in mallards; other species were present in insufficient numbers to permit evaluation of differential mortality between sexes.

DVE mortalities have been found on six areas other than the refuge and the river. Five of these are located within a 7-mile radius of the refuge and the sixth (Red Lake, near Chamberlain, S. D.) is located about 50 air miles northwest of the refuge. The last known case of DVE in this outbreak was a female mallard from Red Lake on March 9.

The total mortality count (ducks and geese actually picked up) as of April 9, 1973, is summarized below.

	On Refuge	On River	Other Areas	Total
Ducks	22,122	6,255	468	28,845
Geese	<u>133</u>	<u>55</u>	<u>47</u>	<u>235</u>
Total	22,255	6,310	515	29,080

SURVEILLANCE

In order to monitor the disease after the flock departed from the Lake Andes area, state and federal biologists in North and South Dakota have been alerted and asked to make regular inspections of key migration areas and to report all wild waterfowl mortalities. This surveillance is being expanded to a nationwide program to quickly identify the spread of DVE in wild waterfowl. Because of the potentially explosive nature of DVE, early detection is essential to limiting the spread of the disease and the magnitude of waterfowl losses. A similar program is being initiated in Canada by the Canadian Wildlife Service.

Continued surveillance has thus far disclosed no additional mortalities since March 9; however, the history of the disease suggests that further outbreaks may be expected, especially as waterfowl congregations build up in staging areas and wintering flocks.

REPORTING SUSPECTED DVE OUTBREAKS

If Duck Virus Enteritis is suspected, immediately notify the nearest Bureau Regional Office. Instructions will then be provided for obtaining an investigation by a diagnostic laboratory.

The addresses and telephone numbers of Bureau Regional Offices are:

Pacific Region - 1500 Plaza Building, 1500 N. E. Irving Street

Portland, Oregon 97208 (503-234-3361)

Southwest Region - Federal Building, U. S. Post Office and Court House

500 Gold Avenue S. W.

Albuquerque, New Mexico 87103 (505-843-2321)

North Central Region - Federal Building, Fort Snelling

Twin Cities, Minnesota 55111 (612-725-3500)